CHAPTER 2

TRAFFIC CALMING MEASURES

Traffic calming involves the use of a number of physical devices installed on streets as well as traditional traffic control devices to reduce the impacts of motorized traffic in urban and residential areas. Traffic calming measures are used on streets when traffic conditions are out of character with their adjacent residential, commercial, institutional, and recreational land uses. The measures may be broadly divided into five (6) groups based on intended impact on traffic:

↓# Speed Control Measures
↓# Volume Control Measures
↓# Vehicle Restriction
↓# Traditional Traffic Control Devices
↓# Intelligent Transportation Systems
↓# Next-Generation Traffic Calming

Speed control measures are primarily used to address speeding problems by changing the vertical and horizontal alignments of roadways or by narrowing them. Volume control measures are primarily used to address cut-through traffic problems by blocking certain movements, thereby diverting traffic to other streets. In many cases, the distinction between speed and volume control measures may not be clear, since volume control measures can also slow traffic while speed control measures can also divert traffic. Vehicle restriction measures are aimed at discouraging specific classifications of vehicles from entering designated streets or areas. Traditional traffic control devices have been used as a form of traffic calming over the years. These include the use of regulatory and warning signs, pavement markings and traffic signals. Intelligent Transportation Systems, which involve the use of new technologies, have been recently incorporated into designs to reduce vehicular speeds, traffic volumes and improve pedestrian safety. Next-generation traffic calming methods are creative – but not yet proven – methods for managing traffic in residential or other sensitive areas.

Considerations in Selecting Traffic Calming Measures

The selection of a traffic calming measure should be based on, but not limited to, the following factors:

1) Street type
2) Speed limit
3) Traffic volume and speed
4) Lanes of traffic and lane use
5) Grades
6) Bus routes
7) Pedestrian/bicyclist safety
8) Truck routes
9) Community facilities
10) Planned improvements

11) Drainage
12) Actual site conditions
13) Adjacent land use
14) Neighborhood character

These should be used in establishing priorities for installing traffic calming measures in residential neighborhoods since specific measures may address one or more of these concerns.

(1) SPEED CONTROL MEASURES

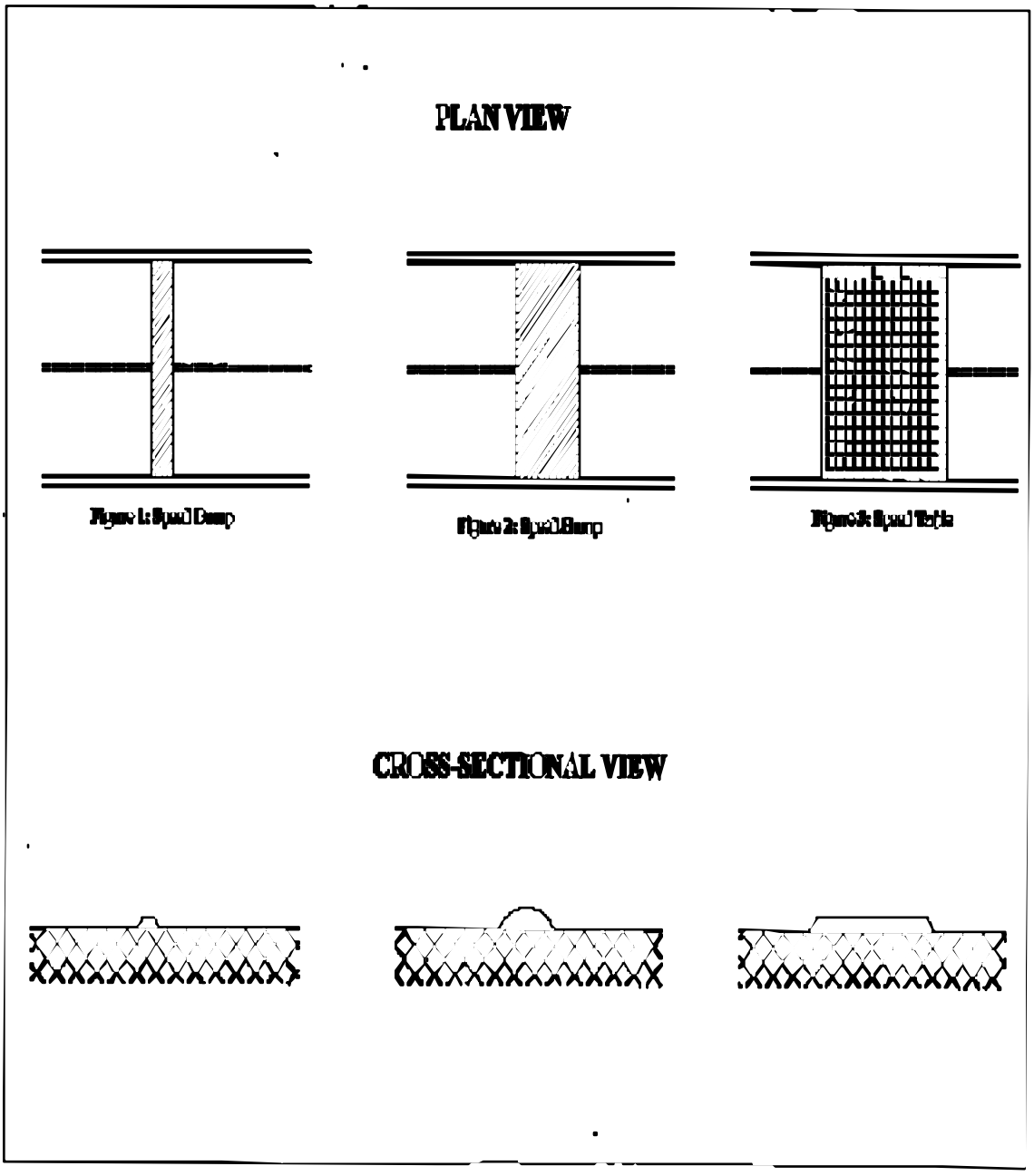
Speed Bumps, Humps and Tables

Speed bumps, humps and tables are raised pavement mounds designed to reduce vehicular speeds. These mounds, which are made of asphalt or recycled rubber, are constructed on streets and spaced between 300 to 600 feet [22] apart. Speed bumps are generally described as narrow, abrupt strips (Figure 1). Speed humps are wider and more gently rounded from start to finish (Figure 2) while speed tables consist of a raised, 10-foot flat-topped section (Figure 3). All are about 3 inches high.

The width of the mound is sometimes chosen based on the posted speed limit, the type of neighborhood, and the type of automobiles using the street. On residential streets where the posted speed limit is 25 mph (or lower), speed humps that are 14 feet wide may be used. On streets where speeds of 45 mph or lower are desired, 22 foot speed humps might be used. On streets used by transit vehicles, or those with exceptionally high volumes, 22 foot humps or tables may be selected instead of the 14 foot speed humps. Some speed bumps are split in half at the centerline of the street. Each half is offset from the other and a small splitter island is constructed. Offsetting the two bump halves enables emergency vehicles to drive around the bumps, significantly reducing delay. Table 2.1 presents the advantages, disadvantages and cost of speed bumps, humps, and tables. (This and all other cost listings that follow are approximations.)

Table 2.1: Advantages, Disadvantages and Cost of Speed Bumps, Humps and Tables

Advantages	Disadvantages	Cost
Reduce vehicle speeds effectively Do not require parking removal Do not affect intersection capacity and operations Pose no restrictions for bicycles, if done well	May increase traffic noise from braking and acceleration of vehicles, particularly buses and trucks Slow fire and emergency vehicles Can affect drainage patterns	$2,000-10,000


PLAN VIEW
CROSS-SECTIONAL VIEW

Roundabouts

Roundabouts are raised circular islands placed at intersections. They are often landscaped with ground cover and street trees. Roundabouts require drivers to slow to a speed that allows them to comfortably maneuver in a counterclockwise manner around the circular island. Roundabouts obviate the need for traffic signals and can be used both on high and low volume streets to allocate rights-of-way among competing movements. The primary benefit of roundabouts is they reduce the number of angle and turning collisions. An additional benefit is that they slow high-speed traffic. Roundabouts are very effective at lowering speeds in their immediate vicinity and are most effective when constructed in series on a local street. In residential areas, a minimum of about 30 feet of curbside parking may have to be removed on approaches to roundabouts. If they are well-designed and appropriately located, roundabouts can safely accommodate trucks and buses.

A typical roundabout is shown in Figure 4. If well-maintained, roundabouts can be very attractive. Excessive use of traffic control signs and pavement markings can reduce the attractiveness of roundabouts.

Traffic Circles

Traffic circles are raised circular islands placed in an intersection, which, like roundabouts, require drivers to slow to a speed that allows them to comfortably maneuver in a counterclockwise manner. Traffic circles are often used at intersections of local streets with high pedestrian or left-turn volumes and may be signalized (see Figure 5). According to some standards, they are also appropriate on local streets where the ADT volumes do not exceed 3,500. [20]

Traffic circles have the same advantages and disadvantages as roundabouts. One difference, however, is that they cost more – much more when signalization is required. Table 2.2 presents the advantages, disadvantages and cost of the installation of roundabouts and circles.

Table 2.2: Advantages, Disadvantages and Cost of Roundabouts and Circles

Advantages	Disadvantages	Cost
Effectively reduce vehicle speeds	May require some parking removal on approaches	$3,000-15,000
Improve safety conditions by reducing the number of angle collisions	Can cause bicycle/auto conflicts at intersections because of narrowed travel lane	
Visually attractive	Can restrict emergency or transit vehicle movement if vehicles are parked illegally near the circle; slows them down regardless	
Often no need for powered traffic control devices		

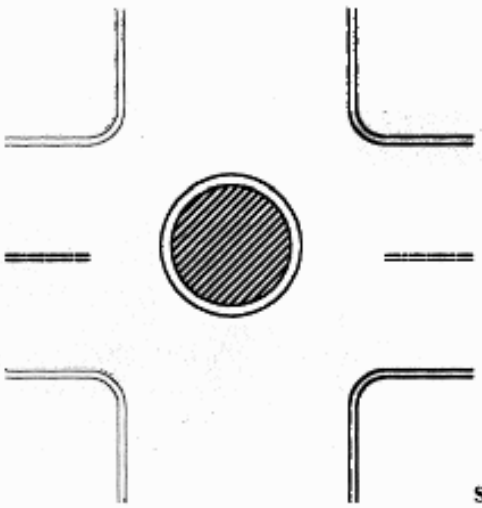


Figure **4:** Roundabout

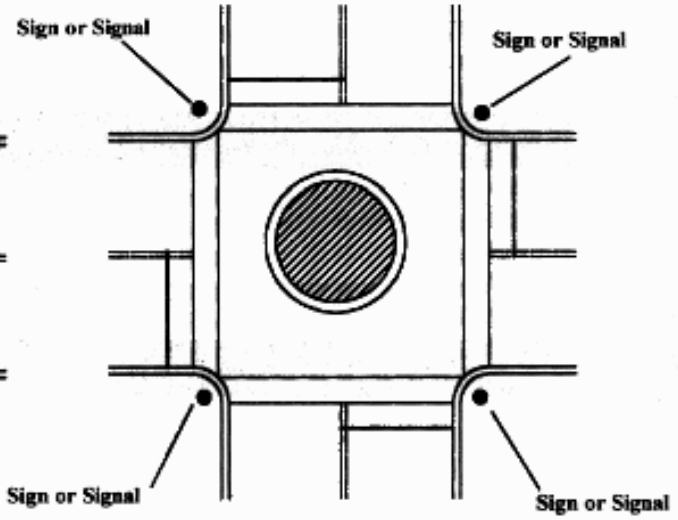


Figure 5: Traffic Circle

Chicanes

Chicanes are series of three or more curb extensions (4 feet minimum) [20] that change a straight roadway into a zigzag or serpentine path. A chicane gives the driver a perception, from a distance, that a street is no longer continuous. It is intended to reduce vehicle speeds with less impact on emergency vehicles, since they can avoid the speed-slowing curves by taking a straight "racing line" through the device. Parking may need to be removed for the construction of chicanes. According to some standards, chicanes are most appropriate on local streets that carry less than 3,500 vehicles per day [20]. They can be used on two-lane, two-way streets or one-lane, one-way streets. Figure 6 illustrates a typical example of a chicane, and Table 2.3 presents the advantages, disadvantages and cost.

Table 2.3: Advantages, Disadvantages and Cost of Chicanes

Advantages	Disadvantages	Cost
Reduce vehicle speeds Reduce traffic volumes Less impact on emergency vehicles May reduce collisions	May require some parking removal May restrict emergency or transit vehicle movement if vehicles are parked illegally near the chicane	$5,000-10,000

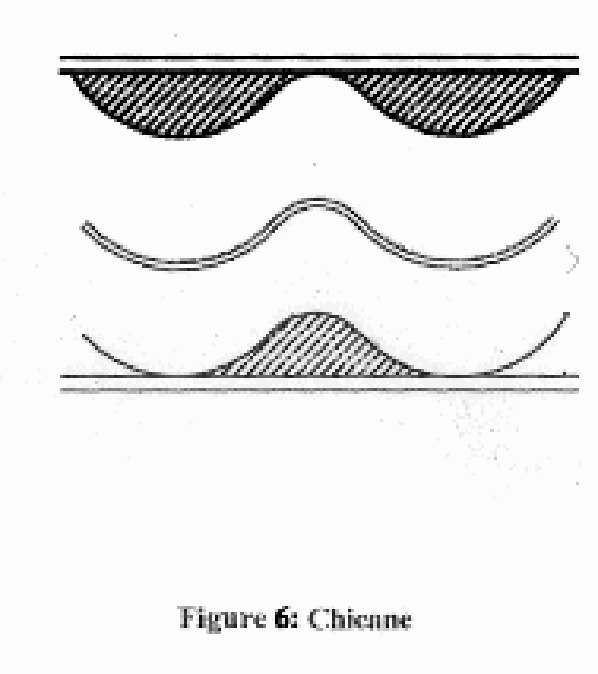


Figure 6: Chicane

Raised Crosswalks

Raised crosswalks are marked and elevated pedestrian pathways constructed 3 to 6 inches[22] above the grade of the street with a typical profile of a speed table. The construction material may be either asphalt or brick. They are intended to reduce vehicle speeds specifically where a high volume of pedestrian crossings is encountered. They are usually appropriate on local streets and minor collectors, with volumes less than 10,000 vehicles per day.[20] A typical raised crosswalk is shown in Figure 7. The cost, advantages and disadvantages of raised crosswalks are presented in Table 2.4.

Table 2.4: Advantages, Disadvantages and Cost of Raised Crosswalks

Advantages	Disadvantages	Cost
Reduce vehicle speeds Does not require parking removal Improve the visibility of pedestrians Improve visibility for pedestrians Improved conspicuity of crossing path	May generate noise from accelerating and decelerating vehicles May cause problems during snow removal Require more maintenance than traditional crosswalks Slows emergency vehicles	$2,000-5,000

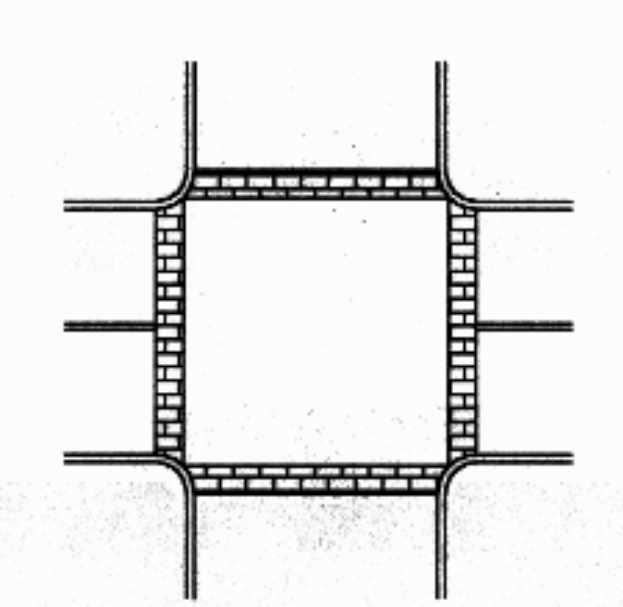


Figure 7: Raised Cross Walk

Raised Intersections

Raised intersections are flat raised areas covering entire intersections which are usually between 3 and 6 inches [22] above street level. The flat section is often constructed with brick or other textured material. They are also called raised junctions, intersection humps or plateaus. They are typically appropriate for local streets and collectors in commercial areas with high pedestrian activity. A typical raised intersection is shown in Figure 8. The cost, advantages and disadvantages of raised intersections are presented in Table 2.5.

Table 2.5: Advantages, Disadvantages and Cost of Raised Intersections

Advantages	Disadvantages	Cost
Reduce vehicle speeds Reduce vehicle-pedestrian conflicts by providing increased visibility of pedestrians Does not require parking removal	May generate noise from accelerating and decelerating vehicles; slow emergency vehicles May cause problems during snow removal Expensive to construct and maintain	$10,000-60,000

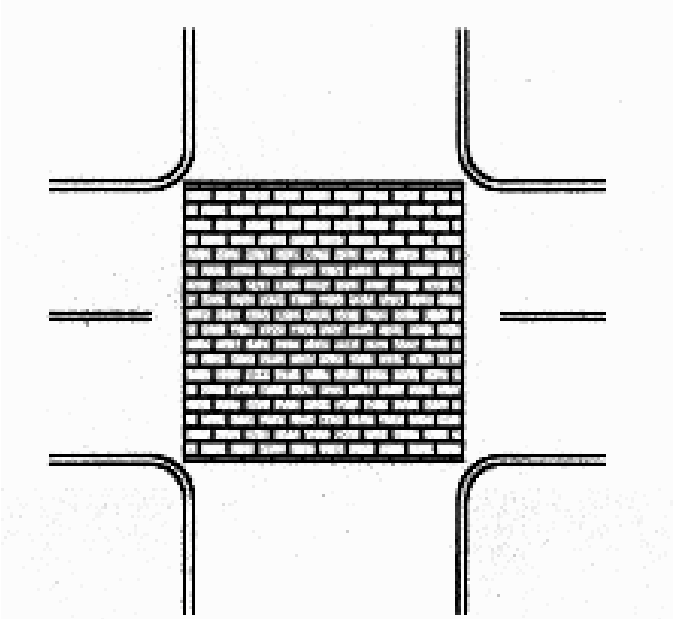


Figure 8: Raised Intersection

Neckdowns

These are curb extensions at the corners of intersections which slow motor vehicles and give pedestrians a shorter widht of street to cross while increasing their visibility to motorists. Neckdowns extend sidewalks into the street from one or more sides, typically up to 6 feet from the existing curb. [20] These are also sometimes referred to as curb extensions or bulb-outs and are appropriate, for example, in downtown areas where posted speed limits are up to 40 mph and ADT volumes are up to 15,000 vehicles per day[22]. Figure 9 shows a typical neckdown. Table 6 presents the advantages, disadvantages and cost of neckdowns.

Table 2.6: Advantages, Disadvantages and Cost of Neckdowns/Knockdowns

Advantages	Disadvantages	Cost
Reduce vehicle speeds Provide safer pedestrian crossings by reducing crossing distance and time Prevent vehicles from passing other vehicles that are turning Prevent illegal parking close to intersection	Can cause bicycle/auto conflicts at intersections because of narrowed travel lane May hinder turning movements of wider fire/emergency trucks due to narrowed travel lane May require some parking removal	$4,000-10,000

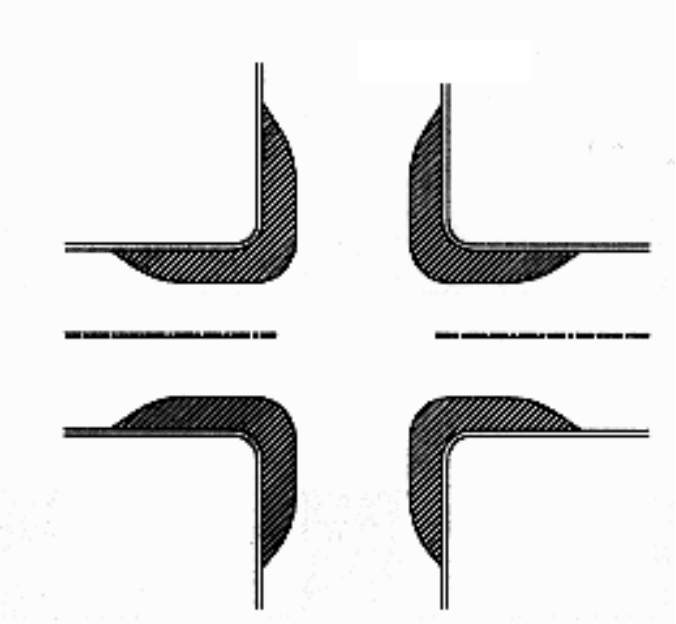


Figure 9: Neckdowns

Chokers

Chokers narrow a street at mid-block (and sometimes near an intersection). This narrowing may be achieved by curb extensions (usually up to 6 feet) [20], landscaping or islands in the street. Chokers are intended to reduce traffic speeds and volumes by making the travel lanes narrower, or even by limiting the roadway to one travel lane, so that only one car at a time can pass through it. They are appropriate in locations where there is significant pedestrian activity, school zones and areas where a high number of senior citizens reside. Figure 10 shows a typical choker. Table 2.7 presents the advantages, disadvantages and cost of chokers.

Table 2.7: Advantages, Disadvantages and Cost of Chokers

Advantages	Disadvantages	Cost
Reduce vehicle speeds Provide safer pedestrian crossings when combined with crosswalks Prevent vehicles from passing Can improve neighborhood appearance with landscaping	Can cause bicycle/auto conflicts because of narrowed travel lane May hinder movements of wider fire/emergency trucks due to narrowed travel lane Require some parking removal If roadway is narrowed to one lane, can lead to unsafe conflicts between vehicles traveling in opposite directions	$3,000-6,000

Figure 10: Chokers

Textured Pavements

Textured pavements, such as those using brick, stone, or grooved asphalt may be used over an extended distance at or near an intersection to cause drivers to reduce speeds. These also can improve the aesthetic quality of the street environment. They are typically used in areas with significant pedestrian activity. Figure 11 shows an example of a textured pavement. Table 2.8 presents the advantages, disadvantages and cost.

Table 2.8: Advantages, Disadvantages and Cost of Textured Pavements

Advantages	Disadvantages	Cost
Reduce vehicle speeds Provide safer pedestrian crossings when used at intersections Can improve neighborhood appearance	May be noisy for neighbors May be bumpy for bicyclists May cause problems during snow removal May lead to increased maintenance costs	$2,000-4,000

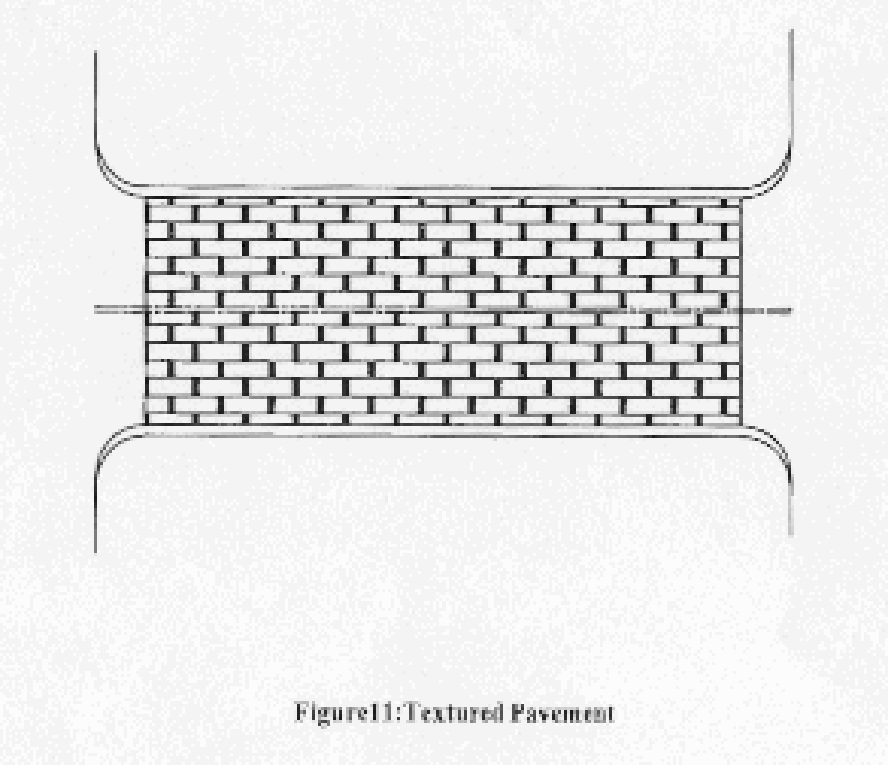


Figure11:Textured Pavement

Rumble Strips

Rumble strips use pavement or pavement markings to create a change of texture in the road surface, which audibly signals drivers to slow down. Typically, they are used where there is significant pedestrian activity, in school zones and in areas where a high number of senior citizens live. Rumble strips are also used on segments or some sections of highways which approach a toll plaza, or in some instances areas when a highway approaches a city. Their objective is to draw the attention of the driver by causing a sudden change in smooth riding surfaces (see Figure 12). With this, however, comes a potential nuisance to neighbors. Table 2.9 presents the advantages, disadvantages and cost of constructing rumble strips.

Table 2.9: Advantages, Disadvantages and Cost of Rumble Strips

Advantages	Disadvantages	Cost
Can reduce vehicle speeds somewhat Provide safer pedestrian crossings when used near intersections	Noisy for neighbors May be bumpy for bicyclists May cause problems during snow removal May be ineffective without follow-on measures	$2,000-5,000

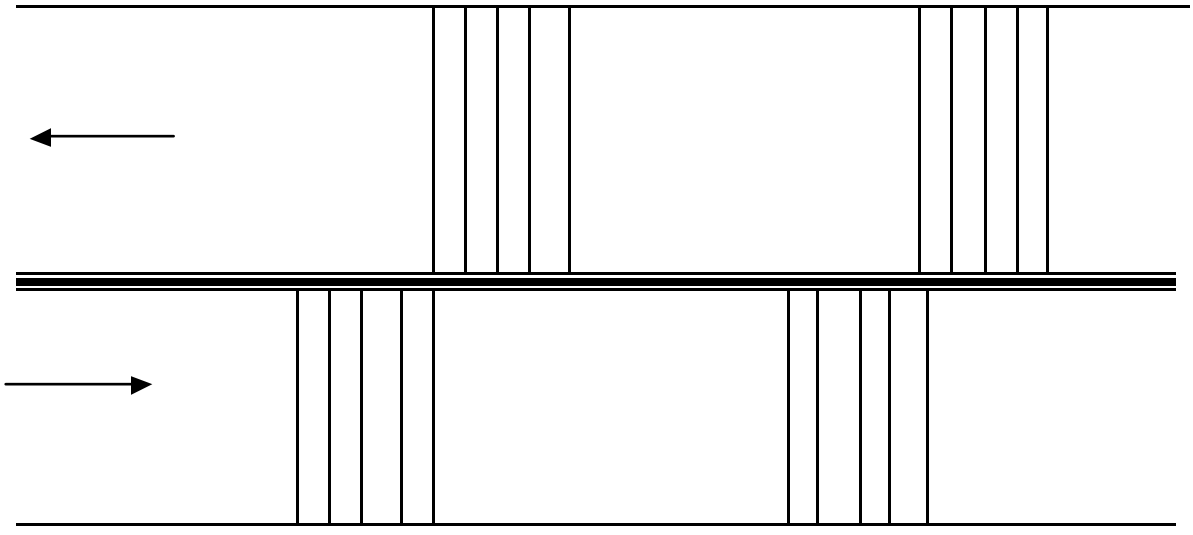


Figure 12: Rumble Strips

Gateways or Entrance Treatments

Gateways are special alterations which give identity to a neighborhood by using a combination of textural and other physical changes to existing conditions. These could be changes in the pavement surface to, for example, brick, stamped concrete or different colored pavements, signaling to drivers that they are entering a neighborhood that may require lower speeds. Pillars and archways are also sometimes used. Gateways are typically used only on local roads and at entrances to residential communities. Figure 13 shows an example of a gateway. Table 2.10 presents the advantages, disadvantages and cost.

Table 2.10: Advantages, Disadvantages and Cost of Gateways or Treatments

Advantages	Disadvantages	Cost
Reduce vehicle speeds Help identify a neighborhood Emphasize change in environment from an arterial to a residential street May discourage truck entry	Noisy for neighbors if textured pavements are used May be bumpy for bicyclists May cause problems during snow removal if textured pavements are used May be ineffective without follow-on measures	$5,000-20,000

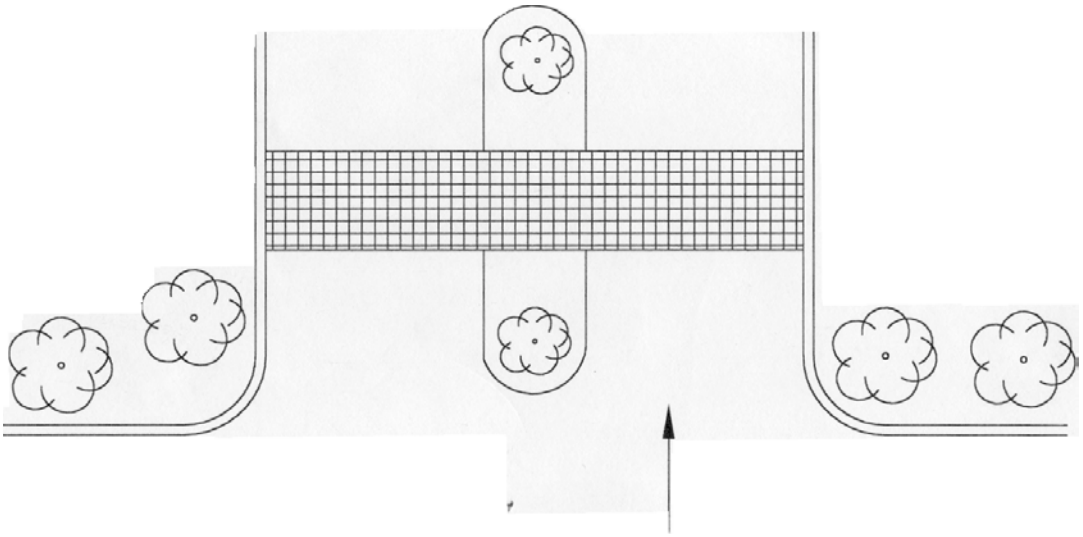


Figure 13: Gateway

On-Street Parking

Parking on one or both sides of the roadway has the effect of reducing roadway width, thereby reducing vehicle speeds. In general, on-street parking is permitted unless otherwise prohibited and may be appropriate for all classification of streets (see Figure 14). Table 2.11 presents the advantages, disadvantages, and cost.

Table 2.11: Advantages and Disadvantages of On-Street Parking

Advantages	Disadvantages	Cost
May reduce vehicle speeds Provides buffer between traffic and pedestrians on sidewalks Generate revenue for local government, if metered	Can reduce visibility of pedestrians and vehicles to each other Increased risk to drivers and cyclists when doors are opened suddenly	$2,000 - $7,000

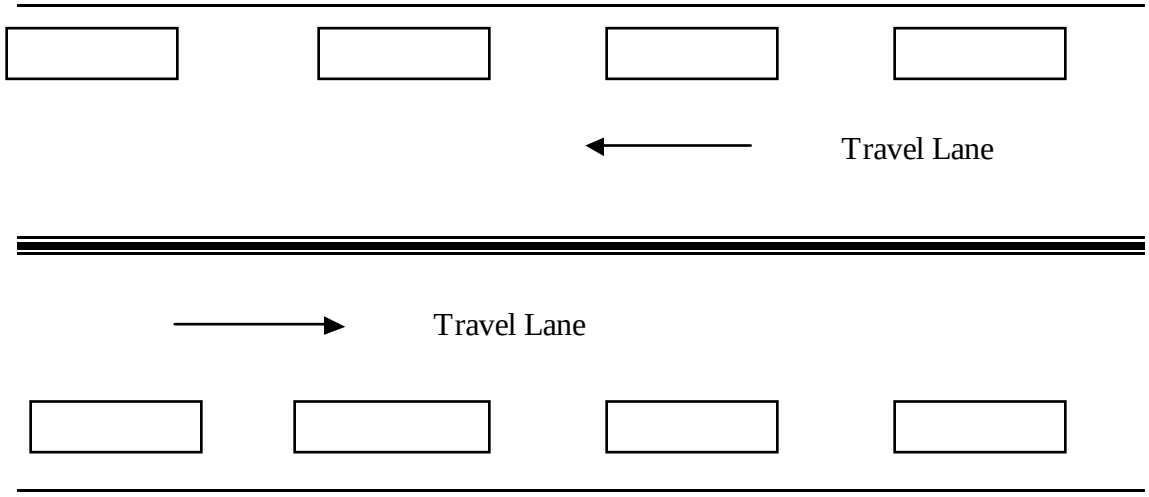


Figure 14: On-Street Parking

Pedestrian Refuges

Pedestrian refuges are narrow islands constructed between travel lanes on local streets, collectors or arterials that are designed with breaks in landscaping and curbing for pedestrians, giving them a safe area halfway across a street [21]. They are typically appropriate either at mid-block locations or intersections and could be 4 to 8 feet wide and 12 to 20 feet long. They may be used on high volume roadways with speeds up to 40 mph. Depending on their location, they may also result in small to moderate traffic speed reductions. Figure 15 shows an example of a pedestrian refuge. Table 2.12 presents the advantages, disadvantages and cost.

Table 2.12: Advantages, Disadvantages and Cost of Pedestrian Refuge

Advantages	Disadvantages	Cost
May reduce vehicle speeds through lanew narrowing Separate opposing vehicle travel lanes Reduce vehicle-pedestrian conflicts Allow pedestrians to cross half of the street at a time	May require some parking removal May restrict access to driveways from one direction	$5,000-15,000

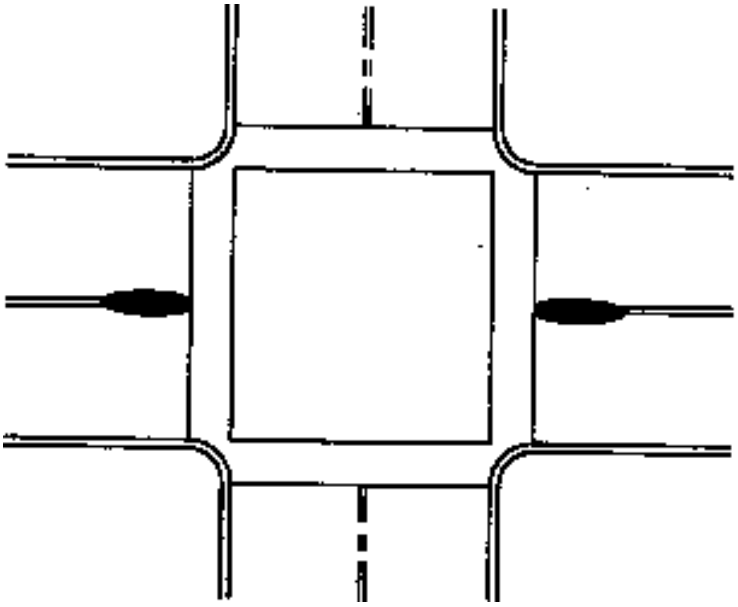


Figure 15: Pedestrian Refuge

(2) VOLUME CONTROL MEASURES

Median Barriers

Median Barriers are narrow islands constructed between travel lanes through an intersection which prevents left turns and through movements to and from minor streets. They are most appropriate on arterials and major collectors at their intersection with local minor streets. They are typically between 4 to 8 feet wide and could be up to 40 feet long depending on the nature and size of the intersection. An example is shown in Figure 16. Table 2.13 presents the advantages, disadvantages and cost.

Table 2.13: Advantages, Disadvantages and Cost of Median Barriers

Advantages	Disadvantages	Cost
Reduce traffic volumes Separate opposing vehicle travel lanes Improve intersection safety and capacity Allow pedestrians to cross half of the street at a time	May affect emergency vehicle access and response Could affect drainage patterns	$2,000-20,000

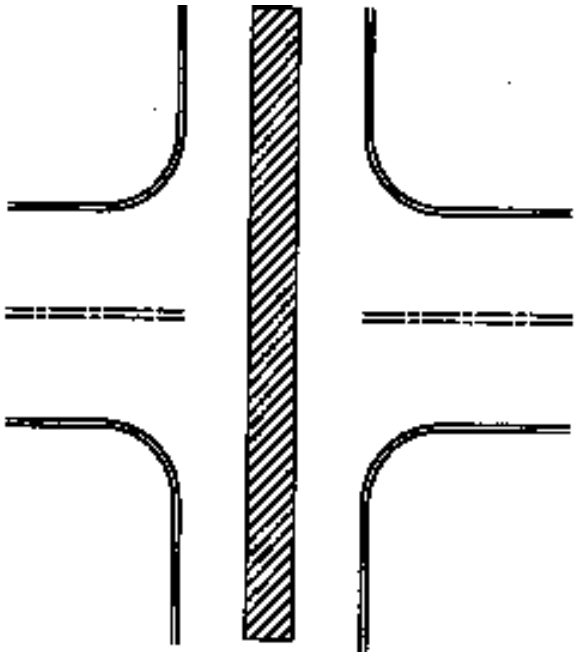


Figure 16: Median Barriers

Full Street Closures

Full street closures are barriers placed across the entire width of a street to completely close the street to through-traffic, usually leaving only sidewalks open. They are also referred to as cul-de-sacs or dead ends. The barriers are typically 4 to 8 feet wide. Full street closures are very effective at reducing cut-through traffic, and traffic volume in general. According to some standards, they are appropriate only on local streets with traffic volumes up to about 3,000 ADT. [20] An example is shown in Figure 17, and Table 2.14 presents the advantages, disadvantages and cost.

Table 2.14: Advantages, Disadvantages and Cost of Full Street Closures/ Cul-de- sacs/Dead Ends

Advantages	Disadvantages	Cost
Reduce traffic volumes Eliminate cut-through traffic May reduce speeds	Affect emergency vehicle access and response Restrict access for neighborhood residents May require acquisition of property to provide a turnaround area of sufficient diameter	$2,000-25,000 (more if property acquisition is required)

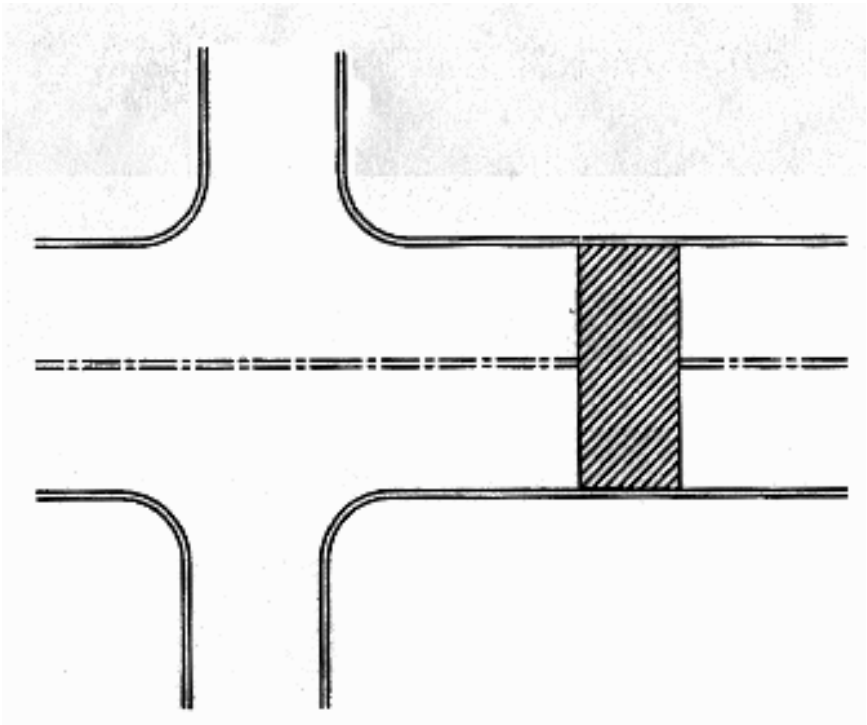


Figure 17: Cul-de-sac

Half Closures

Half closures or semi-diverters are barriers that block travel in one direction for a short distance on an otherwise two-way street. The barriers are typically 4 to 8 feet wide and 16 to 23 feet in length. They restrict access to a street segment while allowing egress from it. They are appropriate only on local streets. An example is depicted in Figure 18, and Table 2.15 presents the advantages, disadvantages and cost.

Table 2.15: Advantages, Disadvantages and Cost of Half Closures

Advantages	Disadvantages	Cost
Reduce traffic volumes Eliminate cut-through traffic May reduce speeds	May affect emergency vehicle access and response Restrict access for neighborhood residents	$2,000-20,000

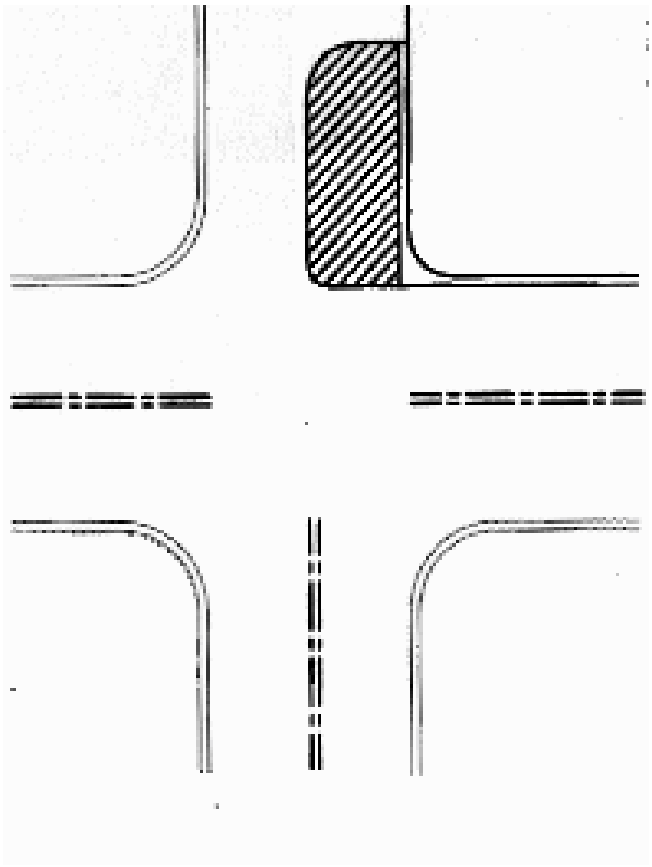


Figure 18: Half Closure

Diagonal Diverters

A diagonal diverter is a partition that connects two diagonally opposite curbs, bisecting the intersection and forcing motor vehicles to slow down and turn (see Figure 19). The partition is usually made of concrete; asphalt is used in some cases. Diagonal diverters prevent through movements at an intersection, thereby considerably reducing traffic volumes. They are usually not installed on transit streets. Diagonal diverters should not be used on primary emergency or fire response routes because of their delaying effects on emergency vehicles. They may, however, be designed and installed to provide for emergency vehicle access, in which case they are called traversable diverters. These provide for pedestrians and bicyclists to cross over as well. Table 2.16 presents the advantages, disadvantages and cost of diagonal diverters.

Table 2.16: Advantages, Disadvantages and Cost of Diagonal diverters

Advantages	Disadvantages	Cost
Reduce traffic volumes Eliminate cut-through traffic May reduce speeds Eliminate conflicting traffic movements thereby potentially reducing crashes	Affect emergency vehicle access and response if not traversable Restricted access for neighborhood residents	$7,000-20,000

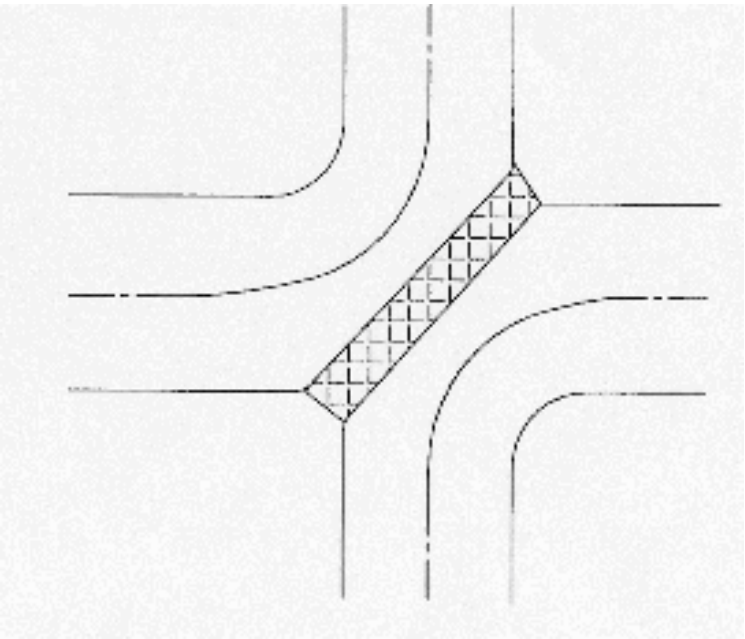


Figure 19: Diagonal Diverters

Forced-turn Islands

Forced turn islands are islands on approaches to an intersection that block certain movements. Typical forced-turn islands are right-in/right-out islands which allow only right turns to be made to and from a local street. Forced-turn islands can also simply be right-out islands (see Figure 20). They can be appropriate at intersections of local streets and arterials. The pros and cons of forced-turn islands are presented in Table 2.17.

Table 2.17: Advantages, Disadvantages and Cost of Forced-turn Islands

Advantages	Disadvantages	Cost
Reduce traffic volumes Eliminate conflicting traffic movements thereby potentially reducing crashes May reduce pedestrian crossing distances thereby improving pedestrian safety	May affect emergency vehicle access and response Local residents may be inconvenienced	$3,000-8,000

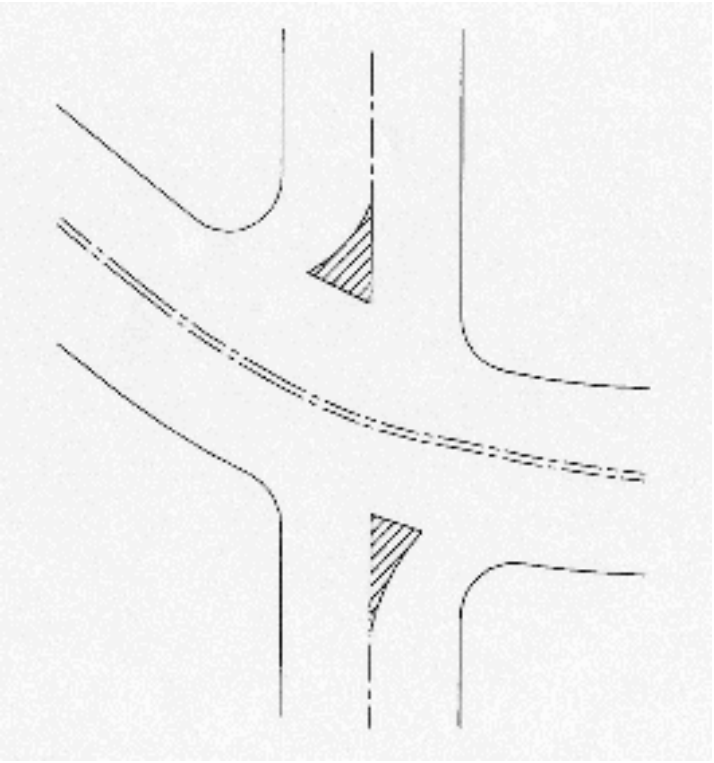


Figure 20: Forced-Turn Island

Combined Measures

In some instances, it is necessary to reduce both vehicular speeds and traffic volumes as well as improve overall safety for all road users. In such cases, a combination of the above-mentioned measures may be used.

(3) VEHICLE RESTRICTIONS

Vehicle restriction involves the identification of a class or several classes of vehicles that must not enter a restricted area. The restriction may be indicated by the use of traditional traffic signs or enforced by physical closings that enable only non-restricted vehicles to enter. Restrictions for heavy vehicles in residential neighborhoods are usually done by signage. To be effective, sign-based restrictions on vehicles need to be enforced.

(4) TRADITIONAL TRAFFIC CONTROL DEVICES

In order to reduce cut-through traffic and slow traffic in residential areas, traffic engineers also rely on traditional signing and pavement markings.

Signing

Traffic calming in residential neighborhoods may be achieved through the deployment of standard traffic signs, uses of which which are outlined in the Manual on Uniform Traffic Control Devices (MUTCD).

a) *Speed Limit Signs*
   Statutory speed limit signs are often deployed to indicate speed regulations. In most instances, speed limit signing functions as a reminder to motorists of a roadway's speed limit. Therefore such signs should be posted at adequate intervals within the speed zone. In most jurisdictions, statutory speed limits are established for the safe and efficient flow of traffic.
b) *Multi-Way Stop Signs*
   Recently, traffic engineers have used multi-way stop signs as a means of calming traffic. This has been somewhat effective in reducing vehicular speeds and increasing pedestrian safety. Multi-way stop sign control, however, should only be installed in accordance with warrants listed in the MUTCD. The use of unwarranted stop signs may create disrespect for stop sign control at other locations where it may be truly needed.
c) *Turn Prohibitions*
   These may also be used during certain periods to reduce cut-through traffic and the potential for crashes at intersections and increase pedestrian safety. Periodic enforcement is needed to ensure continued compliance with restrictions.
d) *One-Way Streets*
   In the absence of police enforcement, turning prohibitions may be violated by motorists. Creating one-way streets is a more effective control of turning movements along a roadway. This measure, however, should only be implemented after careful study and evaluation since it also restricts nearby residents. Furthermore, one-way streets tend to increase vehicular speeds

since there are fewer vehicle conflicts. In such cases, additional traffic calming measures may be needed.

Pavement Markings

Pavement markings have been successfully used to slow traffic in areas such as school zones, hospitals, approaches to severe curves, and narrow roads. In such cases, roads are narrowed with edge lines, possibly inducing drivers to slow down. A similar affect could also be achieved by adding bicycle lanes, which also can reduce lane widths. Thick transverse pavement markings (white or yellow) have also been used in some school zones and hospital areas to alert motorists to slow down.

(5) INTELLIGENT TRANSPORTATION SYSTEMS

Recently, so-called Intelligent Transportation Systems (ITS) have been used in many ways by traffic engineers to effectively manage and move traffic. In addition, ITS technologies have been and are being used in the area of traffic calming in order to reduce speeds and traffic volumes while improving pedestrian safety. The following are a few examples.

a) *Illuminated Pedestrian Crosswalk/Intelligent Crosswalks*
These are light fixtures imbedded in roadways along the boundaries of crosswalks. Upon pedestrian activation by push button, these lights signal drivers to stop for pedestrians to cross. They have been found to effectively attract the attention of drivers thereby reducing approach speeds. They have been successfully deployed at uncontrolled crosswalks at intersections or midblock locations.

b) *Radar Speed Display Units*
Some cities have deployed speed display units along roadways which automatically display the speed of approaching vehicles using radar detection. Research has found that most drivers slow down upon noticing the speed at which they are driving at such locations.

c) *Signal Timing*
Carefully calibrated traffic signal timing plans can discourage excessive speeds by making them unproductive. In other words, if traveling above the speed limit just brings a driver to the next red light faster, he or she may be encouraged to drive the speed limit.

d) *Speed-Actuated Traffic Signals*
These signals can detect vehicle speeds, and if they find that vehicles are traveling at a pre-determined speed above the speed limit, they will turn red in order to stop them and discourage this practice. DDOT is installing a demonstration model in the city.

(6) NEXT-GENERATION TRAFFIC CALMING AND OTHER METHODS

As the practice of traffic calming has matured, creative approaches have been developed to better manage traffic. In Australia, residents of some problem neighborhoods have been encouraged to act as neighborhood "pace cars" – when driving

in their own neighborhoods, they are urged to do so slowly to slow vehicles behind them and eventually affect the local driving culture.

Another neighborhood-based approach to calming traffic involves residents taking down the license plate numbers of drivers they see violating neighborhood speed limits and other traffic regulations and mailing them to local authorities, who then send the alleged rule breakers notifications which encourage them to obey local traffic laws. In some jurisdictions, residents of troubled neighborhoods distribute pamphlets with a similar message.

It should also be noted that consistently stricter enforcement of existing traffic regulations can increase citizens' respect for those laws.

(7) EFFECTIVENESS OF TRAFFIC CALMING MEASURES

The effectiveness of some of the traffic calming measures mentioned in this chapter at addressing volume problems, speed problems, and traffic conflicts, and their effect on emergency service providers, are summarized below:

Traffic Calming Measure	Volume Reduction	Speed Reduction	Conflict Reduction	Emergency Services
Speed Bump	M	S	M	S
Traffic Circle	M	M	S	S
Chicane	M	M	N	M
Raised Crosswalk	M	S	M	S
Raised Intersection	N	M	M	S
Neckdown	N	M	M	N
Chokers	N	M	M	M
Textured Pavement	N	N	N	N
Rumble Strip	N	M	N	M
Gateway	N	N	N	N
Pedestrian Refuge	N	M	M	N
Median Barrier	S	N	M	S
Street Closure	S	M	S	S
Diagonal Diverter	S	M	M	M
Forced-turn Island	M	N	M	M
Speed Limit Signing	N	M	N	N
Multi-way stop control	N	M	M	M
Turn prohibitions	M	N	M	N
One-way streets	S	N	M	M

N = Minimal or no effect
M = Moderate effect
S = Significant effect